

A NEW GHOST MOTH FROM THE SOUTHERN APPALACHIAN MOUNTAINS (HEPIALIDAE)

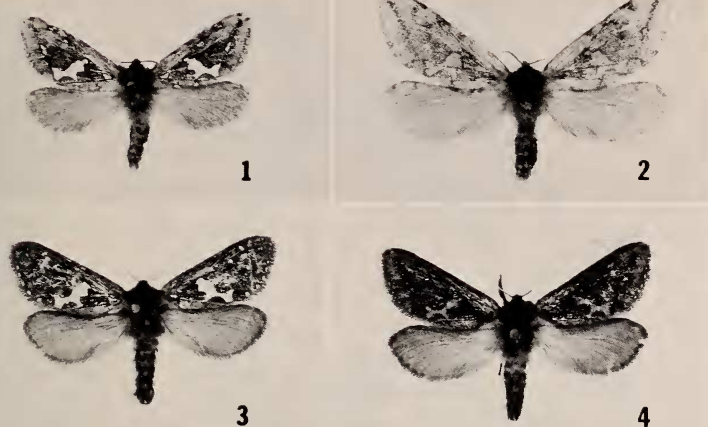
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ABSTRACT. *Hepialus sciophanes*, a new species from a high elevation habitat in Jackson Co., North Carolina, is described and illustrated. Its generic affinities are examined, leading to the conclusion that *Hepialus* as generally understood is heterogeneous. *H. sciophanes* belongs to the *hyperboreus* group of northern and western North America.

Among moths collected in a light trap at nearly 6,000 ft on Waterrock Knob, Jackson Co., North Carolina, in July 1974 were 19 specimens of a very distinct new hepialid, the first new species of this family to be described from North America since 1925. It belongs to the group that includes *Hepialus hyperboreus* (Möschler), *roseicaput* N. & D. (Holland, Pl. 41, Fig. 15, as *hyperboreus*), *pulcher* Grt., *mcglashani* Hy. Edw., and *mathewi* (Hy. Edw.), none of which occurs in the Southern Appalachians. *H. hyperboreus*, or a species resembling it, has been taken on Mt. Washington, New Hampshire, but the North Carolina species differs in color, pattern, and male genitalia. The small, relatively common eastern hepialid, *H. gracilis* Grt., easily distinguished by its smaller size and lack of conspicuous white patches, was the only other hepialid collected on Waterrock Knob.

In an effort to place the new species correctly, I investigated the European type-species of several genera but reached no satisfactory conclusion. Members of the *hyperboreus* group bear a vague resemblance to the type-species of *Phymatopus* Wallengren (*hecta* L.), having comparable although differently developed structures in the male genitalia. Their relationship to the type-species of *Hepialus* Fabricius (*humuli* L.) and *Korscheltellus* Börner (*lupulinus* L.) is less obvious. Indeed, the male genitalia of these European species and the American ones of the *hyperboreus* complex are so different that it is hard to determine whether some of the parts are even homologous. The new species and others of the *hyperboreus* group likewise differ structurally from *H. gracilis*, *H. mustelinus* Pack., and from their close Palearctic counterpart, *H. fusconebulosa* DeGeer. The latter are much closer to *humuli* and *lupulinus* in the form of all major genitalic components such as the tegumen, vinculum, valve and juxta, and agree in the long-stalked condition of $R_2 + R_3$ (almost to apex) in both wings. Until a much-needed generic revision of the Hepialidae is available, species of these several groups had best be referred to *Hepialus* in the broad sense.



FIGS. 1-4. *Hepialus sciophanes*: 1, holotype male; 2, allotype female; 3, paratype male, Waterrock Knob, 5,800 ft, Jackson Co., North Carolina, 16 July 1974, D. C. Ferguson; 4, paratype male, same data.

Hepialus sciophanes, new species

Figs. 1-6

Description. **Venation** (Fig. 5) normal for group but differing from that of at least the most similar eastern species in two respects: R_2 and R_3 of both wings stalked for less than half distance from point of common origin to apex, and R_4 and R_5 unstalked beyond end of cell. In *hyperboreus* and *gracilis* $R_2 + R_3$ fork nearer apex, and R_4 and R_5 have a short stalk beyond end of cell.

Males with color and pattern of wings highly variable; basically light brown with diffuse darker brown lines and shading and a large, elongated white patch in median area of forewing, inclined obliquely toward torus. However, over half the specimens show various degrees of melanism, some heavily suffused with black. Dark markings of **forewing** usually obscured, but when visible, consisting of an almost straight submarginal band from near torus to apex, three costal markings which in higher Lepidoptera would be regarded as rudiments of antemedial, medial, and postmedial lines (in allotype a complete but indistinct medial band present), and diffuse, variable shading in basal and medial areas that does not resolve itself into definite markings. Pale markings of forewing consist primarily of the large, white or cream-colored, oblique, somewhat angulate medial patch, and secondarily of several much smaller whitish spots as follows: one or more near base, two or three beyond middle of costa, one or two on inner margin, one or two near mid-zone of submarginal band, one very small dot near middle of second anal vein, and a subterminal series of five dots. In half of the specimens the large white patch is reduced or obscured, and in only three are all white spots present. These white markings are clearly disconnected components of the pattern seen in more complete form in other species such as *H. hyperboreus*, *mathewi*, or *mcglashani*, and cannot be reconciled with the very different patterns of *H. gracilis* or *Sthenopsis auratus* Grt., the only other southern Appalachian species of comparable size. **Hindwing** light brown with thin yellowish costal and outer margins faintly spotted with brown between vein endings, or darker without yellowish border. **Underside** of light specimens brown, with markings of upperside in part showing through faintly

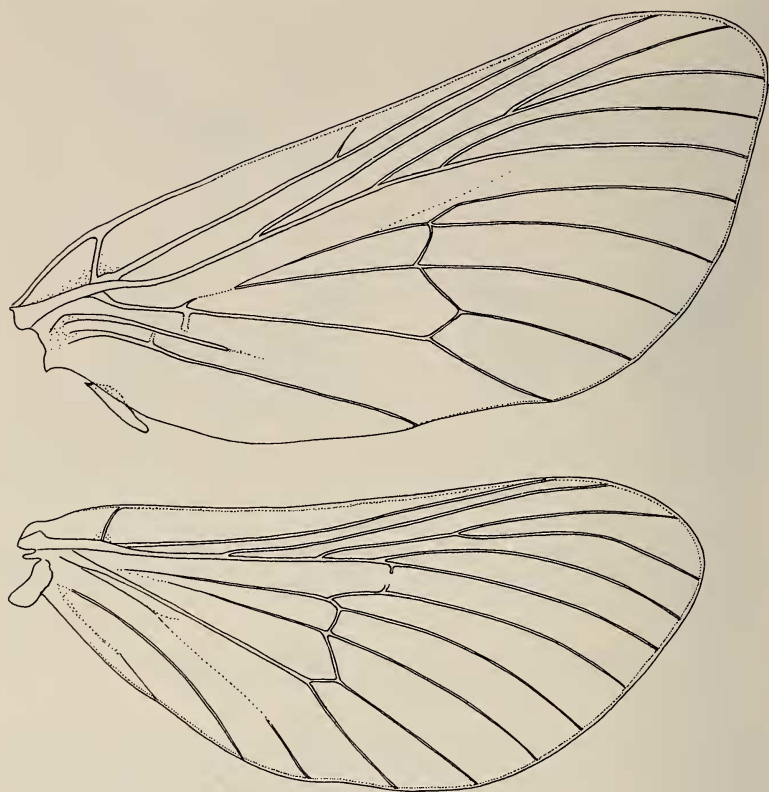


FIG. 5. *Hepialus sciophanes*: wing venation of male (paratype).

and with costal and outer margins somewhat yellowish; underside of dark specimens darker brown, usually without yellowish margins. The allotype, which is the only known female, is a lighter brown than most of the males, and its pale markings are suffused with gray. External structure of **head**, **antennae** and **legs** apparently similar to that of other Hepialidae mentioned.

Male genitalia as illustrated (Fig. 6). Valve well developed, two-lobed. Dorsal end of tegumen with pair of hairy lobes suggesting socii; a juxtalike plate between bases of valves, and a medial, basically membranous structure, resembling and probably functioning as an aedeagus, with a distinctive apical sclerite bearing a long, slender spine; the latter partly encircled by an elaborate, sclerotized structure, in function probably serving the dual role of gnathos and transtilla, although homologous with neither. Female genitalia not examined.

Length of forewing. holotype male, 15 mm; paratype males, 15–18 mm; allotype female, 20 mm.

Types. Holotype, male, Waterrock Knob, 5,800 ft, Jackson Co., North Carolina, 16 July 1974, D. C. Ferguson. Type No. 76,131, U.S. National Museum. Allotype, female, same data but collected 17 July. Paratypes, 17 males, same locality and collector, 16–17 July 1974. Paratypes deposited in U.S. National Museum, Canadian National Col-

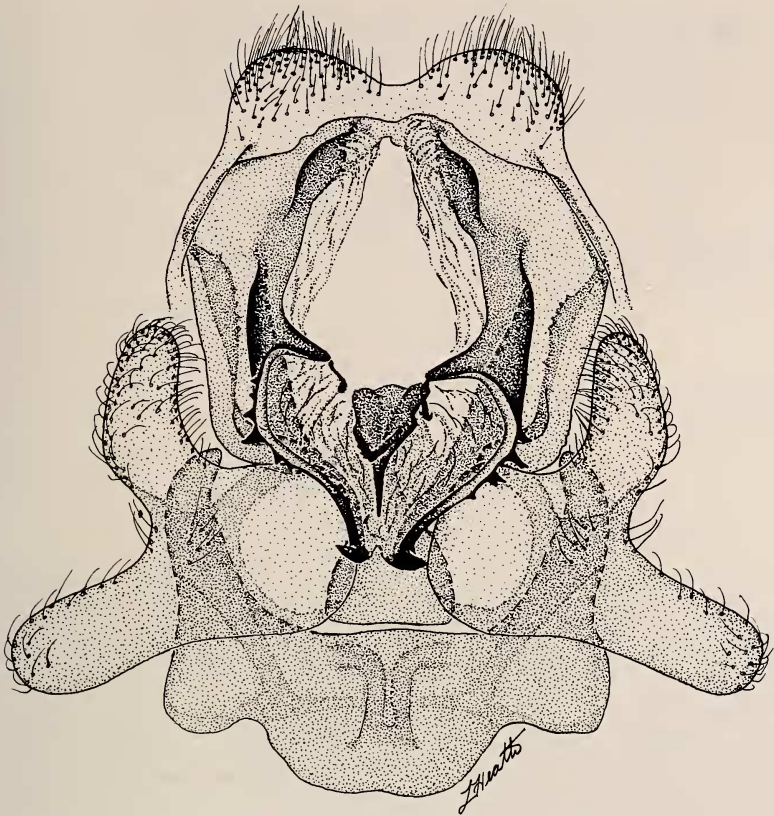


FIG. 6. *Hepialus sciophanes*: male genitalia (paratype).

lection, British Museum (Natural History), and the collection of Norman B. Tindale, Palo Alto, California.

Remarks. The type series was collected 500–600 ft S or SW of the Blue Ridge Parkway, opposite the entrance to the trail leading to the summit of Waterrock Knob, which is on the other side of the road. The trap was located in a grassy clearing, a small “bald,” on the mountain slope just outside of a large stand of Fraser fir and yellow birch that occupies the ridges and summits at that elevation and above. The vegetation in the immediate vicinity consisted mainly of grasses, ferns, *Vaccinium corymbosum* L., *Rhododendron* and *Viburnum* species.

Five species of Hepialidae occur in the southern Appalachians: *H. gracilis* (*H. mustelinus*, if indeed a distinct species, may also be there), *H. sciophanes*, *Sthenopsis auratus* (easily distinguished by the extensive gold or silvery markings on the forewing), *S. argenteomaculatus* (Harris), and another large species resembling *S. quadri-*

guttatus Grt., known from only one poor specimen from Gatlinburg, Tennessee. *Sthenopsis quadriguttatus* and *argenteomaculatus* were figured by Holland (Pl. 41, Figs. 13, 14). All of these are otherwise more northern species, or of northern affinity, reaching their southern limit in the mountains of North Carolina or Tennessee. No Hepialidae are known from the southeastern Coastal Plain or Piedmont.

LITERATURE CITED

HOLLAND, W. J. 1903 [or later editions]. The Moth Book. 479 pp., 48 pls. Doubleday, Page & Co., New York.

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GENERAL NOTES

A LIST OF LARVAE SUSTAINED ON WHEAT GERM DIET

A wheat germ diet has been formulated for the puss caterpillar (Khalaf 1974, Fla. Entomol. 57: 377-381). It consists of wheat germ, casein, sugar, salts, inhibitors, linseed oil, cholesterol, vitamins, antibiotics, and agar. Recently, the same diet was tested and found suitable for rearing various species of moths. All these, throughout this project, were collected as larvae from the field after feeding for variable periods on their natural host plants.

Young larvae of the following species utilized the diet for a period of ten days to a few weeks and then formed either cocoons or adults: the pyralids, *Evergestis rimosalis* (Guenée) and *Glyphodes pyloalis* (Walker); the notodontid, *Schizura unicornis* (J. E. Smith); the noctuid, *Spodoptera latifascia* (Walker); the arctiid, *Diacrisia virginica* (Fabricius); the yponomeutid, *Plutella xylostella* (L.); the cochlid, *Sibine stimulea* (Clemens); the lasiocampid, *Malacosoma disstria* Hübner; and the liparid, *Hemerocampa leucostigma* (J. E. Smith).

Mature larvae of the arctiid, *Estigmene acrea* (Drury), and the noctuid, *Spodoptera eridania* (Cramer) also utilized the diet for about one week or more and then formed cocoons or adults. More than ten specimens of *E. rimosalis*, *S. latifascia*, *D. virginica*, *S. stimulea* and *H. leucostigma* were reared on the diet. Only a few specimens of the rest of the species were reared. This diet was slightly modified, mainly by substituting corn oil for the linseed oil, and was used to rear the puss caterpillar (Khalaf 1975, Biology of the Puss Caterpillar and its Ichneumonid Parasite. Loyola Univ. Press, New Orleans, Louisiana. 43 p.). I have used the same modification to raise several other species of moths: 1) Recently hatched larvae of the noctuid, *Spodoptera eridania* (Cramer); and liparid, *Hemerocampa leucostigma* (J. E. Smith) utilized the diet and formed cocoons or adults. 2) Young larvae of the following species utilized the diet for a few weeks: the arctiid, *Ecpantheria scribonia* (Stoll), the notodontid, *Schizura unicornis* (J. E. Smith) and the noctuid *Spodoptera latifascia* (Walker). 3) Mature larvae of the following species also utilized the diet and formed adults: the lasiocampid, *Malacosoma disstria* Hubner; the arctiids, *Diacrisia virginica* (Fabricius), *Isia isabella* (J. E. Smith), and *Hyphantria cunea* (Drury); the noctuids, *Zale lunata* (Drury), *Acronicta arioch* Strecker, and *Xanthopastis timais* (Cramer); and the saturniid, *Automeris io* (Fabricius).

In rearing some of the species, e.g., *Sibine stimulea*, the diet seemed to interfere with cocoon formation. As the larvae became full grown, I found it was better to plate